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IMPROVE PROCESSES, SAVE METAL IN BEARING INDUSTRY

/This report consists of the lead articles from the first two issues of Podshipnik (Bearings) which started publication in January 1952. This monthly periodical is an organ of the Ministry of Automobile and Tractor Industry USSR. G. V. Androsov is the chief editor and A. S. Kireyev the deputy editor. Circulation is 1,950.

The periodical has the following defined goals: (1) To state and amplify the basic questions of technical policy in the field of bearing building. (2) To discuss questions of principle in the design, manufacture, choice, and use of antifriction bearings. (3) To supply technical information and exchange experience relating to the production of bearings and the organization of labor.

It is the aim of the periodical to publish articles dealing with the following: (1) Improving the production of bearings. (2) Analyzing the quality of equipment used in the production of bearings; modernizing and building new types of equipment. (3) Designing and carrying out research on the work capacity of antifriction bearings. (4) Raising the technological level of bearing utilization. (5) New forms of labor organization. (6) Questions bearing on the economics of production.

The periodical is intended for technologists, designers, planning and production specialists, scientific workers, and also for highly skilled workers, Stakhanovites and innovators of bearing plants, for the engineering and technical force of bearing repair plants and technical installation offices, and for specialists in bearing use in various fields of industry./

PUBLICIZE THE EXPERIENCE OF PRODUCTION INNOVATORS IN EVERY POSSIBLE WAY -- Moscow, Podshipnik, Jan 1952

The Moscow First State Bearing Plant imeni L. M. Kaganovich (director, Devyatov), the Kuybyshev Order of Lenin /Fourth State/ Bearing Plant (director, Vasil'yev) and the Second State Bearing Plant (director, Bakhvalov), are plants

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of collective Stakhanovite labor and are now aiming for the title of plant of excellent quality. Making the experience of these advanced plants available to other bearing plants plays an important role in converting the whole bearing industry to collective Stakhanovite labor.

There are many Stakhanovites at bearing plants whose experience and remarkable achievements merit emulation. Foremen Aleksandr Burov of the First State Bearing Plant initiated the widespread application of the so-called mixed (skvoznyy) method of work. In sections where this method of organizing work was used, labor productivity has increased, utilization of equipment has improved, rejects have been lowered, and the wages of set-up men and machine tool operators have increased.

Now many complex brigades have been organized in other plants of the bearing industry. More widespread adoption of this experience is needed. The work experience of grinder Turtina (First State Bearing Plant), forger Sukhinin, foreman Karetin (Fourth State Bearing Plant), forelady Kozhevnikova (Second State Bearing Plant), and others merits serious attention.

The adoption of statistical control methods at the First State Bearing Plant and the Fourth State Bearing Plant provides much valuable experience. The Saratov Bearing Plant has adopted high-speed machining of bearing parts and the ball shop of the Khar'kov Bearing Plant has adopted a new, advanced method of machining balls.

However there are serious shortcomings in the study and circulation of the progressive experience of production innovators. The leaders of some enterprises do not devote sufficient attention to generalizing this experience and to bringing their lagging plants up to the level of the advanced plants.

In particular, the Kuybyshev /Ninth State/ Bearing Plant (director, Dundukov) does not meet its production plans, mainly because socialist competition is badly directed there. Several shops of the plant have received the Stakhanovite title, even though they do not fulfill the plan for raising labor productivity and lowering production costs, and even though they turn out a far too high percentage of rejects.

At the same time, the Kuybyshev Order of Lenin /Fourth State/ Bearing Plant successfully fulfills its production plan, making wide use of the most advanced Stakhanovite methods (the plant has the title of Plant of Collective Stakhanovite Labor).

One of the most important tasks of socialist competition is to help lagging enterprises raise themselves to the level of the most advanced. The leaders of the Main Administration of the Bearing Industry apparently have lost sight of this task

Another serious shortcoming in the industry is the fact that valuable innovations are not recognized and circulated rapidly. The leaders of many enterprises for some reason find it convenient to await orders from the ministry or to mark time for several months before they actually adopt something new.

Formalism and sporadic "campaigns" are still permitted in the leadership of competition. Often, learning of the achievements of a Stakhanovite, the plants merely hang a placard with an appeal to workers to attain the level of the most advanced and do not consider it necessary to reveal how these successes were achieved nor to support and circulate the best methods.

Let us cite other examples. At the First State Bearing Plant, there have been instances where machine tools were counted as put on the socialist maintenance program by one machine tool operator when other people were working on the machine tool, and where brigades were counted as excellent-quality brigades when they had long since been dissolved. The introduction of the statistical control method was carried out without effective preparation and support; as a result, it did not give the proper results. It is high time to put an end to this formalistic attitude to circulating the experience of innovators.

The task is to organize a mass patriotic movement to raise the quality of finished bearings and to get everybody from the designer to the assembler into this movement

WAYS AND MEANS OF SAVING METAL IN THE BEARING INDUSTRY -- Moscow, Podshipnik, Feb 1952

In the past 2 years, and especially in 1951, large-scale measures for saving metal and reducing the specific consumption of metal have been put into effect at all bearing plants. As a result, the coefficient of utilization of metal as a whole in the bearing industry increased 18.6 percent in 1951 as compared with 1950.

The forge shops play a leading role in the general complex of measures taken to increase the coefficient of utilization of metal. One of the basic measures taken in these shops is the reduction of allowances for machining and reduction of tolerances on forgings made on horizontal forging machines.

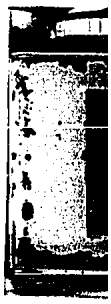
The theoretical allowance for machining should be of such magnitude that, after decarturization and all defects are removed from the surface of the forging, there should be a minimum allowance for grinding.

In actual practice, it has been necessary, until recently, to take into consideration variations in wall thickness. As a result, allowances for machining exceed the minimum necessary allowance by 2 to 2.5 times. Moreover, lowering existing allowances in plant forges by a mere 25 percent would produce a 10 to 12 percent metal savings and raise the coefficient of utilization of metal by 12 to 15 percent.

Adoption of the new method of stamping rings on horizontal forging machines in closed dies (proposed by Abramov of the First State Bearing Plant) solves the problem of obtaining forgings with precise dimensions, with a low degree of eccentricity, without side and face flashes, and consequently, with minimum allowances for machining.

Modernizing horizontal forging machines by the method used at the First State Bearing Plant, putting them into the proper technical condition, the adoption of stable setup of die forging tools and constant checking of their condition, all these measures make it possible to reduce allowances to a minimum. That is the first part of the problem; the second part is to obtain forgings within the weight limits set by the norms (with the understanding that the norms be set on the basis of reduced allowances).

The majority of our forge shops usually forge parts using, for the most part, a peripheral field of allowances, that is, with the maximum allowances. As a result, the actual weight of forgings exceeds the weight set by the norms, since the norms are calculated not by maximum, but by average tolerances.



The following measures are necessary to eliminate the shortcomings in the performance of forge shops:

1. Utilize the experience of the First State Bearing Plant and the Ninth State Bearing Plant in adopting the statistical control method on horizontal forging machines, adding to this dimensional control the weight control of forgings.

2. Apply in all forge shops a methodology of planning forging tools that will produce forgings with minimum allowances for machining.

3. Organize accounting of the delivery of metal to the working place based on the experience of the First State Bearing Plant.

Similar reductions should be made in the allowances on free forgings.

Many plants cut the stock for free forgings of rings by preliminary marking of the bar, taking into account the tolerance on the material. This makes it possible to cut stock of the minimum permissible size and with identical volume /with that of the forging/, which in turn permits minimum allowances in machining. This method should be adopted in all bearing plants.

The new method, adopted at the Ninth State Bearing Plant, of free forging the rings of large-sized rings of taper roller bearings by using backing dies and rolling the outer rings of large sized double-row taper roller bearings makes it possible to reduce metal consumption by 12 to 15 percent. This method should be used at all bearing plants.

The rolling of rings, which reduces the allowances for machining large-sized rings, should be improved. Wider application should be made of profile rolling of roller grooves and slots, which makes it possible to save 4 to 6 percent of the metal.

Considerable metal savings could be made by reducing ends (scrap) in forge shops and by using these ends.

By stamping rings in closed dies, the length of ends is reduced up to 40 percent; but not all plants are giving sufficient attention to this fact. Moreover, there is the erroneous belief that reducing ends of metal is not important, since these ends are utilized at any rate. The error in such reasoning lies in the fact that the yield of usable forgings from ends is considerably lower than from fresh metal.

Valuable work in reducing the length of ends from taper ring forgings is being carried out at the Third State Bearing Plant, the Ninth State Bearing Plant, and the Fifth State Bearing Plant, which have reduced ends by 15 to 20 times. At these plants, the end is spot welded (kontaktnaya stykovaya svarka) to the bar of fresh metal (up to 70 millimeters in diameter). The end is then held with the tongs and the bar is used to make forgings right up to the point where it is welded onto the end. This method should be widely adopted for bars up to 120 millimeters in diameter.

In the field of free forging, the method of preliminary (prior to broaching holes) expansion of the metal with tapered dies should be adopted. This method, proposed by Kuprin of the First State Bearing Plant, makes it possible to reduce the weight of punchings 2.5 to 3 times.

Ends from horizontal stamping machines are usually used for free forgings, for forging lock rings, and also for miscellaneous uses in the tool and repair machine shops.

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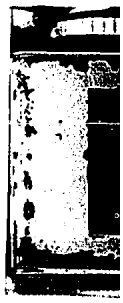

The Third State Bearing Plant has recently started using a new method of utilizing ends, in which they are stretched under a hammer forge to bars of smaller diameter. These reduced-diameter bars are then used to make rings of smaller diameter on horizontal forging machines. The ends from these forgings are then flattened into strips and used for making lock rings.

Also of interest is the experience of the Ninth State Bearing Plant in reforging rejected rings into rings of other sizes and the experience of the Fourth State Bearing Plant in the reforging of used rings into other sizes.

Furthermore, our plants could use all kinds of ends and rejected rings by slitting them and rolling them into strips for subsequent forging into lock and tapered rings. Forge shops should be supplied with at least one powerful rolling press for this purpose.

The waste of metal by burning must be mentioned, since losses of metal during heating for stamping amount to 1.5 to 3 percent. Since most rings are reheated because of the wide use of rolling, there are further losses due to burning. Thus the reduction of these losses is an important problem. The primary solution of this problem is the adoption of induction heating, which reduces losses due to burning to a maximum of one percent and improves the quality of forgings. This method is already used at the First State Bearing Plant and should be adopted at all bearing plants.

Rejects must also be reduced by eliminating their causes in the actual machining operations and also in the setting up of equipment. The best ways to achieve this end are the adoption of statistical control in the forge shops, modernizing and improving the technical condition of forge machines, improving the condition of forging tools, and increasing the stability of setup operations.

To decrease "setup" rejects, the experience of forger Kositsin (Ninth State Bearing Plant), who completely eliminated rejects due to faulty setup of the machine, must be circulated to all forge shops.

To decrease the specific consumption of metal by reducing allowances for lathe machining, the workers of the automatic lathe shops and tool workers must join forces with the forgers. Lowering allowances makes it necessary to improve clamping devices used in machining rings on lathes and semiautomatic machine tools. Only complete elimination of pulsation in jaw [chucks] on lathes will make it possible to reduce to the minimum allowances for machining. This is the basic and not-too-complex problem of workers in automatic lathe shops and toolmakers.

Another important measure for saving metal in automatic lathe and grinding shops is the sharp reduction of unavoidable regulated technical losses in setting up, which can be achieved by simplifying the setting-up process. The use of adjusting patterns and gauges in automatic lathe shops should be expanded to the maximum extent, and the use of nonadjustable fittings, base cutting tool holders, and interchangeable cutters should be adopted. Adoption of these measures alone in 1952 would reduce unavoidable technical losses in setting up by no less than two times.

In 1952, more active measures must be taken to reduce metal losses in cutting rings from tubes and bars. It is sufficient to note that reducing the width of the cutting off cutters by one millimeter makes it possible to save more than 3 percent of the metal.

The plants and the Scientific Research Institute of the Bearing Industry should solve this problem by reducing the width of the blade of cutters and taking more decisive action to introduce anode-mechanical cutting. Anode-mechanical cutting will make it possible to save 6 percent of the metal, which at present goes into shavings.

There must be a further reduction of allowances in automatic lathe shops working on tubes (tubular stock), which will require improvement of clamping devices on automatic machine tools and improvement of the quality of the blanks cut off (to be sure that they are perpendicular to the axis of the bar stock). To achieve this, it will be necessary to devote special attention to the stability of supports and to reduce flying out of the cutting blade.

All plants are not yet making use of the ends of tubular stock. In particular, the Eighth State Bearing Plant makes little use of tubular ends for the inner rings of ball bearings and the Second State Bearing Plant makes little use of tube ends for the rings of single-thrust bearings. These plants should lose no time in organizing sections for the full use of ends.

It is appropriate to mention at this point the Second State Bearing Plant's inefficient (from the point of view of consuming scarce chrome steels) practice of making the rings of single-thrust bearings out of tube stock. In view of the fact that all bearing plants make rings for single-thrust bearings out of forging ends, the Second State Bearing Plant should adopt this method as more economical.

In the automatic lathe shops and sections, which operate on bar stock, metal could be saved by: (a) wider application of aggregate cutting; (b) reducing the thickness of cutting-off tools; (c) reducing the size of undercuts of bars after regular feeding in; and (d) reducing the size of ends. Let us discuss the last two measures.

In most automatic lathe shops, the size of undercuts is as great as 1.0 and even 1.5 millimeters instead of the 0.2 to 0.3 millimeter set by the norm, which causes a 3-4 percent overconsumption of metal. This is due to the unsatisfactory conditions of material stopping mechanisms (and of the stops themselves) on machine tools and to poor setting up. Automatic lathe shops should pay strict attention to the conditions of stops on machine tools and adjust them in good time. They should also check the condition of cutters so that undercutting of bars does not exceed the permissible limits.

Reducing the size of ends of metal on automatic lathes has a great effect on metal savings. The size of these ends is dictated by the design of the gripping and feeding tongs, and also by the length of the feeding tube. Holding tongs with reduced length holding parts (15-20 millimeters) must be adopted in production more decisively, and a careful check should be made to see that the length of the feeding tubes on the machine tools is not less than set by the norm. The old method of restoring feeding tubes, in which they were shortened in the process, must be abandoned and the method used by the First State Bearing Plant and the Eighth State Bearing Plant, in which a tube of the same diameter with a thread for the feeding tongs is butt welded to the feeding tube, should be adopted. This produces a normal size feeding tube, and consequently, normal sized ends.

Reducing allowances for machining is also the means of increasing the coefficient of utilization of metal in the ball and roller shops. The Second, Third, and Eighth State Bearing Plants have reduced metal consumption by 6-12 percent and raised the coefficient of metal utilization by 7 to 14 percent. The experience of these plants should be utilized by other plants, especially the First State Bearing Plant. In particular, the cold stamping of balls up to 1 1/16 inches in diameter makes it much easier to reduce the allowances for the remaining machining on these parts.

In the roller shops, the reduction of allowances is particularly important in making precision rollers and needles. Thus, at the Third State Bearing Plant, the allowance for machining precision rollers of all sizes is one millimeter, while an allowance of 0.5 to 0.6 millimeter is sufficient. Reducing the original diameter of the bar stock in the production of precision rollers makes it possible to save up to 5 percent of the metal. The reduction of ends and their utilization is of equal importance in ball and roller shops. Experience in stamping balls and rollers on horizontal presses without leaving ends should be circulated to all bearing plants.

At the First State Bearing Plant, at the suggestion of Pavlov, the ends from automatic lathes in the roller shop, and also in the bar and tube shop, are used as blanks for making large sized rollers on ordinary turret lathes which are specially set up.

Ends of small-diameter bars can be utilized, as they are at the Eighth State Bearing Plant, by cutting them into blanks for stamping balls on vertical presses.

It may be noted here that a number of plants use rollers that have been rejected after various operations for stamping balls on vertical presses.

Bearing plants and ENIIPP (Experimental Scientific Research Institute of the Bearing Industry) should push research work toward reducing the thickness of cutting-off blades to achieve a further reduction of metal consumption.

Moreover, the adoption (especially at the Third State Bearing Plant) of a new, original process of making cylindrical rollers which completely eliminates metal losses in cutting off /the blank/ on lathes should be speeded up. This process consists in cutting off the blank on presses and subsequently knurling a chamfer on a special knurling machine of simple design with automatic feed of the rollers.

Cage shops, in making cages out of band /metal/, must eliminate losses caused by leftovers in cutting widths out of coils.

The possibility of repeated use of circular stampings should also be investigated.

However, the basic measure for reducing metal consumption in the production of cages (up to 7-8 percent) is the use of double-row cutting off instead of the predominating single-row method. It will not be easy to solve this problem; however, it must be done, since double-row cutting saves a great deal of cage band.

Even greater savings of metal are possible in making cages out of nonferrous metals. Here, two paths must be followed: first, existing technological processes must be improved; allowances must be reduced, losses due to burning must be lowered (by using induction smelting furnaces) and using ends; and in the second place, and this is most important, ways must be found of replacing nonferrous metals with ferrous metals.

Substitution of stamped steel cages for brass cages in 2712, 9412, and other bearings shows that it is possible to make a similar substitution in a large group of bearings. Moreover, according to existing data, brass cages can be replaced with cast-iron cages in some types of barrel-shaped and single-thrust bearings. Unfortunately, research in this field is proceeding at an extremely slow pace, and this should be remedied by the TsKB PP (Central Design Bureau of the Ball Bearing Industry) and ENIIPP.

The bearing industry needs new technological processes which will produce parts ready for grinding without lathe machining. Methods such as those used at the Eighth and Second Bearing Plants in making adapter sleeves (the stamping of adapter sleeves out of sheet steel instead of turning them out of tubular stock), raising the coefficient of utilization of metal from 0.21-0.26 to 0.65-0.75 percent, should be used widely.

Cold stamping should be used for all sizes of adapters. The drawing adapters of large-sized railroad bearings should be made in approximately the same manner.

Examples of advanced processes worked out by ENIIPP are the production of taper and cylindrical bearings by butt welding the widths of metal and subsequently calibrating them during grinding, and also the process now being worked out for making the outer rings of taper roller bearings by forging them on horizontal forging machines out of ShKh15 and 18KhGT steel with subsequent calibration during grinding. Of special interest is the process developed by ENIIPP for making the rings of large-sized bearings by centrifugal casting, which produces a blank of accurate geometrical form and precise weight.

The above-mentioned list is by no means exhaustive, and only the broad participation of the masses of workers, engineers, and technicians will assure the successful fulfillment of the enormous tasks lying ahead in the field of saving and increasing the coefficient of utilization of metal.

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